refinement and skill that centuries of scientific education could furnish. Does this not suggest a conception of law, of rationality, of an adaptation between the human mind and the external world, which is not yet fully appreciated?

Besides the repetitions due to rhythm and the scale, there are the more complicated ones due to the repetition of phrases and arias. The *Leitmotiv* and the variations of a theme are examples of more complex modes of musical repetition. The laws of harmony reveal the same tendency towards a recognition of identity, in combination with those numerical relations which underlie the formation of the scale. The appreciation of the more complicated harmonies depends on natural gifts as well as on musical training.

M. Soret considers the aesthetic aspects of color as regards mixture, juxtaposition, repetition, in a similar way; and, though there are many suggestive analogies thus brought out, the subject is hardly sufficiently well known to warrant precise statements.

The final portion of the address is devoted to the beautiful in nature. In the animal world symmetry is certainly evident; and though this symmetry is not perfect in various attitudes, still we readily recognize its nature; and, in fact, this mobility is itself pleasure-giving. In the lower forms of life, repetition of design, as the stripes of a zebra, the markings of a caterpillar or a butterfly, is abundant. Continuity and roundness of outline is certainly a prominent feature of animal forms. The mutilation or natural defect of parts of the body spoils the regular effect, and is thus ugly. Of course, as regards man, the animal which we know so intimately, the psychic elements play an active part in the conception of beauty; but these are not now under consideration. By comparison we erect a type, an ideal, and judge of beauty by its conformity to that ideal.

Turning to the vegetable world, we find exquisite symmetry, graceful outline, and repetition of design, represented as before. And into that combination of foliage with sky and earth which forms scenery, these elements enter, but do not sufficiently explain the enchanting effect of beautiful landscape. In short, there is a physical basis of aesthetics; but it is far from perfectly understood, and in part is so closely connected with higher aspects of beauty, that its nature remains unrevealed. J. J.

THE Lehigh valley railroad is to be equipped with the Phelps system of train telegraphy, by which moving trains can be kept in constant communication with headquarters or with any station on the line of the road.

RECENT PALEONTOLOGICAL PUBLICATIONS.

Revision of the Palaeocrinoidea. Part iii. By C. WACHSMUTH and F. SPRINGER. Philadelphia, *W. P. Kildare, pr.*, 1886. 8°.

WACHSMUTH and Springer have issued separately an extract from the Proceedings of the Academy of natural sciences, forming an octavo of some two hundred pages, and containing a discussion of the classification and relations of the brachiate crinoids with the conclusion of the generic descriptions, errata, and a full index. This important work forms part iii. of their revision of the Palaeocrinoidea, and will be indispensable to all students of that remarkable group of animals. The total number of genera recognized is 156; of species, 1,276. Sixty-one of the genera are exclusively American; forty-eight, exclusively European; forty-six are common to both hemispheres; one is peculiar to Australia. The authors do not claim that all the species included and referred to their proper genera in their list are actually well founded: on the contrary, many may prove eventually synonymous with previously described forms. However, there are numerous undescribed species; and the writers claim that at least one hundred such are contained in their own collection, to be hereafter described and completely illustrated in a monograph of the Palaeocrinoidea of North America. The group formerly described by them as the family Ichthyocrinidae, with the addition of Crotalocrinus and Enallocrinus, is now erected into a sub-order, Articulata, containing two families, — the Ichthyocrinidae and Crotalocrinidae. Further indication of the details of a work which is in itself a synopsis are impracticable within the limits to which we are restricted, — a fact which we regret the less, since all those directly interested will, without doubt, possess and profit by the original.

Geological survey of Alabama. Parts i. and ii. By T. H. ALDRICH and O. MEYER. Tuscaloosa, *Geol. surv.*, 1886. 8°.

Bulletin No. 1 of the geological survey of Alabama, directed by Prof. E. A. Smith, forms the first contribution toward a work undertaken by Mr. Truman H. Aldrich, illustrating the paleontology of the tertiary formation in Alabama. This work, which is to be the gift of Mr. Aldrich to the state of Alabama, will embrace figures and descriptions of all the shells found in the tertiary deposits of the state, including reproductions of figures published elsewhere, and, when finished, will be one of the most complete works of the kind published by any state.

In the preparation of this bulletin, Mr. Aldrich has personally gone over the greater part of the ground, and has collected a large part of the ma-

terial himself. He has thus been able to give to each species, not only its locality, but also its stratigraphical position.

The bulletin contains a preface by the state geologist, together with a summary from his forthcoming report, of the subdivisions of the various deposits which make up the tertiary formation in Alabama, and a description of their stratigraphical and lithological features. Then follows Mr. Aldrich's paper, including notes and descriptions of species, with a summary of their geological and geographical distribution, illustrated by six well-executed plates. Mr. Aldrich, besides many new species, describes a new genus, Expleritoma, which somewhat resembles an ecarinate Magilus with the tube broken off. The species E. prima comes from the Claiborne sands.

Mr. Aldrich's paper is succeeded by one in which Dr. Otto Meyer describes some species of eocene fossils from Alabama and Mississippi. It is illustrated by three plates. Dr. Meyer also gives us a new genus of pteropods, which he calls Bovicornu, differing from Styliola by a slight spiral twist. It is from the eocene of Red Bluff, Mississippi.

These publications will stimulate and encourage the study of the tertiary fossils of the United States, — a field hitherto left to a very few workers, and of late almost neglected. All paleontologists will wish success to Mr. Aldrich in his praiseworthy undertaking.

Brachiopoda and Lamellibranchiata of the Raritan clays and greensand marls of New Jersey. By R. P. WHITFIELD. Washington, *Government*, 1885. 4°.

Volume ix. of the monographs of the U. S. geological survey is a report on the fossil Brachiopoda and Lamellibranchiata of the Raritan clays and greensand marls of New Jersey, by Prof. R. P. Whitfield. It was made to Professor Cook, state geologist of New Jersey, who, deeming it worthy of a place in the series of monographs, transmitted it to the director of the national survey, together with a sketch of the geology of the cretaceous and tertiary formations of New Jersey. This is illustrated by sections. The whole volume comprises three hundred and thirty-eight pages and thirty-five admirable plates, quarto. The Raritan clays are considered to be cretaceous by Professor Cook, though some paleontologists have considered the estuary forms sparingly found in them to closely resemble those of the Wealden or Jurassic age. Mr. Whitfield seems to incline to this view. The greensand marls are unquestionably cretaceous, and overlie, conformably, the clays. The majority of the fossils described in the report are of this age. Those from the plastic clays are mostly internal casts, poorly preserved in a friable matrix, which is also strongly impregnated with pyrites; so that, unless immediately soaked in glue, collections soon decompose and crumble, leaving no organized traces behind. The beds at the top of the marl-bed appear to be eocene, though showing some transitional features.

The types have been gathered from many sources, the state collection having only a small part of them. The earlier types are nearly all lost, owing to the decomposition above referred to, which affects the marl fossils as well as those from the clays.

These fossils attracted the attention of paleontologists at an early day. Morton and Vanuxem began describing them in 1828. The bringing-together of the scattered literature and correcting it to date will prove of much value to students; and the work, representing the labor of the pioneers in paleontology on this continent, will remain a standard of reference for a long time to come.

Ambonicardia is proposed for a form referred to the Veniliidae and related to Veniella; Meleagrinella and Gervilliopsis, for new forms of Aviculidae. The total number of species treated of is two hundred and thirty-two, of which seven belong to the Brachiopoda. An edition of this report with the state imprint has been issued at Trenton, N.J., as 'Paleontology of the cretaceous and tertiary,' vol. i; but it is, for all practical purposes, exactly the same work.

THE glaciation of the Lackawanna and Wyoming valleys, in north-eastern Pennsylvania, has afforded Prof. J. C. Branner interesting material for a detailed local study, published in the recent Proceedings of the American philosophical society. The district is of value as being on the line of farthest glacial advance. The author finds that the ice, when at its greatest thickness, was influenced only by the greater average features of the surface; and consequently what appears to have been an upward movement of the ice is upward only in a local sense. Further, as the ice thinned by melting, its southern margin became more and more under the influence of local topography, and the directions of the striae are changed. Professor Branner does not follow Kjenelf in regarding the preservation of older striae under divergent lines of later formation as evidence of no significant glacial erosion, but rather as showing the small power and short duration of the thin ice-margin that made the later striae. The paper includes two contoured maps, with striae printed in red, and accounts of bowlders, pot holes, new channels, and other related questions.